

# **AIR DISPERSION MODELING ANALYSIS**

## **Pacific Ethanol Magic Valley, LLC Burley, Idaho**

*Prepared for:*  
Pacific Ethanol, Inc.  
400 Capitol Mall  
Suite 2060  
Sacramento, CA 95814

*Prepared by:*  
Natural Resource Group, LLC  
Tower One, Suite 580  
1515 Arapahoe Street  
Denver, CO 80202



**February 2008**

*Project No. PAC2007-091.06*

## **Air Dispersion Modeling Analysis**

### **Pacific Ethanol Magic Valley, LLC Burley, Idaho**

Prepared for:

Pacific Ethanol, Inc.  
400 Capitol Mall  
Suite 2060  
Sacramento, CA 95814

Prepared by:

Natural Resource Group, LLC  
Tower One, Suite 580  
1515 Arapahoe Street  
Denver, CO 80202

February 2008

## TABLE OF CONTENTS

<b>Section</b>	<b>Page</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>iii</b>
<b>1.0 INTRODUCTION.....</b>	<b>1</b>
<b>2.0 FACILITY EMISSIONS SOURCES .....</b>	<b>2</b>
2.1 Potential Emissions .....	2
2.2 Source Types and Parameters.....	2
<b>3.0 MODELING METHODOLOGY .....</b>	<b>3</b>
3.1 Modeling Applicability .....	3
3.2 Significance Modeling.....	3
3.3 Full Impact Analysis (FIA).....	4
3.4 Modeling Options.....	5
3.5 Ambient Air Boundary.....	6
3.6 Receptor Grid .....	6
3.7 Meteorological Data.....	6
3.8 Building Downwash .....	7
3.9 GEP Stack Height Determinations .....	7
<b>4.0 DISPERSION MODELING RESULTS .....</b>	<b>8</b>
4.1 Significance Modeling Results.....	8
4.2 Nearby Sources.....	8
4.3 Background Concentrations .....	8
4.4 NAAQS Analysis.....	9
<b>5.0 MODELING RUNS AND OUTPUT .....</b>	<b>10</b>

## **LIST OF TABLES**

<b>Table</b>	<b>Description</b>	<b>Page</b>
TABLE ES-1.	SUMMARY OF DISPERSION MODELING ANALYSIS RESULTS	iii
TABLE 3-1.	SIGNIFICANT CONTRIBUTION LEVELS	3
TABLE 3-2.	ACCEPTABLE AMBIENT CONCENTRATIONS	4
TABLE 3-3.	NATIONAL AMBIENT AIR QUALITY STANDARDS AND COMPLIANCE METHOD	5
TABLE 3-4.	USGS DIGITAL ELEVATION MODEL (DEM) FILES	6
TABLE 4-1.	BACKGROUND CONCENTRATIONS FOR BURLEY, IDAHO	8

## **LIST OF APPENDICES**

<b>Appendix</b>	<b>Description</b>
APPENDIX A	MODEL INPUTS AND RESULTS
APPENDIX B	FACILITY PLOT PLAN
APPENDIX C	MODELING FILES (CD-ROM)

## EXECUTIVE SUMMARY

Natural Resource Group, LLC (NRG) has performed a revised air dispersion modeling analysis for the Pacific Ethanol Magic Valley, LLC (Facitliy) facility located in Burley, Idaho, using the United States Environmental Protection Agency's (USEPA's) Industrial Source Complex Short-Term Version 3 (ISCST3) with Plume Rise Model Enhancements (PRIME) model. ISCST3 is a steady-state Gaussian plume model recommended by the USEPA for assessing pollutant impacts from facilities with emission points influenced by building downwash, such as the Magic Valley ethanol plant. This dispersion modeling analysis is required as part of the Application for the Authority to Construct submitted November 2006 to the Idaho Department of Environmental Quality (IDEQ).

In accordance with Idaho Department of Environmental Quality (IDEQ)'s State of Idaho Air Quality Modeling Guideline (the Guideline) dated December 31, 2002, the ambient air impacts resulting from the proposed construction of the Facility's ethanol plant have been assessed for particulate matter less than 10 microns in diameter (PM<sub>10</sub>), nitrogen oxides (NO<sub>x</sub>), acetaldehyde, arsenic, benzene, cadmium, formaldehyde, nickel, and total PAHs. The results of the dispersion modeling analysis performed are summarized in the following table.

**TABLE ES-1. SUMMARY OF DISPERSION MODELING ANALYSIS RESULTS**

Pollutant	Averaging Period	Modeled Ambient Concentration (µg/m <sup>3</sup> )	Background Concentration (µg/m <sup>3</sup> )	Total Concentration (µg/m <sup>3</sup> )	IDAPA AAC (µg/m <sup>3</sup> )	NAAQS (µg/m <sup>3</sup> )
<b>PM<sub>10</sub></b>	24-Hour	13.1747	76	88.1747	---	150
	Annual	3.3911	27	30.3911	---	50
<b>NO<sub>x</sub></b>	Annual	4.3485	17	21.3485	---	100
<b>Acetaldehyde</b>	Annual	0.2786	---	---	0.45	---
<b>Arsenic</b>	Annual	0.00002	---	---	0.00023	---
<b>Benzene</b>	Annual	0.0531	---	---	0.12	---
<b>Cadmium</b>	Annual	0.0001	---	---	0.00056	---
<b>Formaldehyde</b>	Annual	0.0311	---	---	0.077	---
<b>Nickel</b>	Annual	0.0002	---	---	0.0042	---
<b>Total PAHs</b>	Annual	0.00003	---	---	0.00034	---

The results of this dispersion modeling analysis shown above indicate that the construction of the Facility will not cause or significantly contribute to a violation of the PM<sub>10</sub> or NO<sub>2</sub> National Ambient Air Quality Standards (NAAQS) or Idaho Administrative Procedures Act (IDAPA)'s Acceptable Ambient Concentrations (AACs) of Toxic Air Pollutants (TAPs).

## **1.0 INTRODUCTION**

Natural Resource Group, LLC (NRG) has performed a revised air dispersion modeling analysis for the Pacific Ethanol Magic Valley, LLC (Facility) facility located in Burley, Idaho, using the United States Environmental Protection Agency's (USEPA's) Industrial Source Complex Short-Term Version 3 (ISCST3) with Plume Rise Model Enhancements (PRIME) model. ISCST3 is a steady-state Gaussian plume model recommended by the USEPA for assessing pollutant impacts from facilities with emission points influenced by building downwash, such as the Magic Valley ethanol plant. This dispersion modeling analysis is required as part of a revision to the Application for the Authority to Construct originally submitted November 2006 to the Idaho Department of Environmental Quality (IDEQ).

The Facility is proposing to increase corn throughput for loadout and delivery purposes. The emissions from the increased corn throughput will be handled by stacks SV01 and SV02, and emissions will remain the same from these point sources. However, increased fugitive emissions from loadout and grinding operations, as well as increased fugitive dust emissions from truck traffic have been accounted for in the modeling analysis. In addition, the Facility is proposing to replace the control equipment for stack SV12. The Regenerative Thermal Oxidizer (RTO) referenced in the original application will be replaced with a Regenerative Catalytic Oxidizer (RCO). Also, the Distillation Scrubber will no longer be routed to the RCO, but will vent to atmosphere. Modeling for the Facility has been revised to reflect the change in the control equipment. In addition to the change in equipment, the stack dimensions have also been modified. Updated emission rates and stack dimensions are contained in Table A-1 and Table A-2 of Appendix A.

## **2.0 FACILITY EMISSIONS SOURCES**

### **2.1 Potential Emissions**

Air pollutant emissions from the facility are generated by material handling, fuel combustion, and ethanol production process operations. The primary pollutants emitted will be PM/PM<sub>10</sub>, NO<sub>x</sub>, SO<sub>2</sub>, VOC, and CO. In addition, the Facility will emit toxic air pollutant (TAPs). A summary of the potential emissions from the proposed facility constructions and supporting emission calculations are included in the November 2006 Application for the Authority to Construct. Table A-1 of Appendix A presents the emission rate of pollutants modeled in this analysis.

### **2.2 Source Types and Parameters**

There are several types of emission sources that can be modeled in ISCST3. These source types include point sources, area sources, and volume sources. The majority of sources modeled are point sources, which consist of emission units that release all (or most) of their emissions out a stack or vent. Some sources, however, are much more complex and difficult to model using mathematical simulations. Fugitive sources such as the emissions from material handling operations do not typically have a single point of emission and are typically categorized as "pseudo" point, area, or volume sources. The Facility sources include conventional point and fugitive sources.

Each source of emissions has several parameters that are required for the dispersion modeling analysis. The parameters for the sources included in this analysis are presented in Tables A-2 and A-3 of Appendix A, respectively. Table A-4 presents a summary of the results. The facility plot plan is included in Appendix B.

### 3.0 MODELING METHODOLOGY

USEPA's ISCST3 PRIME model was used to estimate the potential air quality impacts of the proposed ethanol facility. ISCST3 is a steady-state Gaussian plume model recommended by the USEPA for assessing pollutant impacts from facilities with emission points influenced by building downwash, such as the Facility. When conducting a comprehensive NAAQS compliance demonstration, existing background air quality data is combined with modeled impacts and compared against the applicable standard.

#### 3.1 Modeling Applicability

Dispersion modeling has been conducted to evaluate the potential impacts from the proposed facility's PM<sub>10</sub> and NO<sub>x</sub> emissions for comparison to the applicable short-term and annual significant contribution levels and NAAQS. For TAPs, dispersion modeling was performed to determine the potential impacts from the proposed facility's acetaldehyde, arsenic, benzene, cadmium, formaldehyde, nickel, and total PAHs emitted above Idaho Administrative Procedures Act (IDAPA) 58.01.01.585 and 586 screening emission levels (ELs) for comparison against their Acceptable Ambient Concentrations (AACs).

#### 3.2 Significance Modeling

To determine whether emissions of a pollutant are required to be modeled for comparison with the ambient air standards (full impact analysis), it must be determined if the emissions have a significant impact on ambient air quality. Receptor grids used for determining significance are the same as those used in the refined modeling analysis (see Section 3.6). If the maximum modeled off-site concentration is greater than the significant contribution level (SCL), the source impact is considered significant and a full impact analysis (FIA) must be performed. The SCLs are listed below in Table 3.1.

**TABLE 3-1. SIGNIFICANT CONTRIBUTION LEVELS**

Pollutant	Significant Contribution Level (µg/m <sup>3</sup> )	
	24-Hour	Annual
PM <sub>10</sub>	5	1
NO <sub>x</sub>	---	1

For TAPs, the maximum modeled off-site concentration for the TAP is compared to its AAC for compliance determination. Table 3.2 lists the AACs for the modeled TAPs.

**TABLE 3-2. ACCEPTABLE AMBIENT CONCENTRATIONS**  
**Pacific Ethanol Magic Valley, LLC – Burley, Idaho**

<b>Toxic Air Pollutant</b>	<b>Acceptable Ambient Concentrations (<math>\mu\text{g}/\text{m}^3</math>)</b>
Acetaldehyde	0.45
Arsenic	0.00023
Benzene	0.12
Cadmium	0.00056
Formaldehyde	0.077
Nickel	0.0042
Total PAHs	0.00034

### **3.3 Full Impact Analysis (FIA)**

Pollutant emissions from a proposed facility or modification, which could have a significant impact on air quality, must be demonstrated to not cause or significantly contribute to a violation of the ambient air quality standards. For major PSD sources, the FIA must demonstrate compliance with the NAAQS and PSD increments. For non-PSD major sources, the FIA must demonstrate compliance with the NAAQS.

The NAAQS were established by the USEPA under the authority of the Clean Air Act. Primary NAAQS define levels of air quality that the USEPA deems necessary to protect public health. Secondary NAAQS define levels of air quality that the EPA judges necessary to protect public welfare from any known, or anticipated adverse effects of a pollutant. Examples of the public welfare that are protected by the secondary NAAQS include wildlife, buildings, national monuments, vegetation, visibility, and property values. The USEPA has NAAQS for the following criteria pollutants:  $\text{PM}_{10}$ ,  $\text{PM}_{2.5}$ ,  $\text{NO}_2$ ,  $\text{SO}_2$ , CO, ozone, and lead. Table 3.3 lists the NAAQS as well as the compliance demonstration method for the pollutants included in this analysis.

**TABLE 3-3. NATIONAL AMBIENT AIR QUALITY STANDARDS  
AND COMPLIANCE METHOD**

Pollutant	Averaging Period	NAAQS ( $\mu\text{g}/\text{m}^3$ )	Compliance Method
PM <sub>10</sub>	24-Hour	150	Highest 2 <sup>nd</sup> Highest Ambient Concentration
	Annual	50	Highest Ambient Concentration
NO <sub>2</sub>	Annual	100	Highest Ambient Concentration

### 3.4 Modeling Options

All regulatory default options, except missing meteorological data, are selected for the analysis. These options include:

- No gradual plume rise (except for building downwash)
- Stack tip downwash (except for cases outlined in the Guideline)
- Buoyancy induced dispersion (except for Schulman-Scire downwash)
- Calm wind data processing
- Upper bound concentration estimates for sources influenced by building downwash from super-squat buildings
- Default wind speed profile exponents
- Default vertical potential temperature gradients

Based on land use classifications from United States Geological Survey (USGS) topographical maps, the majority (*i.e.*, > 50%) of the land surrounding the proposed facility can be classified as suburban or rural. Therefore, the rural dispersion coefficients are used.<sup>1</sup> Elevated terrain is used in the modeling analysis to accurately account for the mild geographical terrain features surrounding the proposed site. The terrain elevations are established using digital elevation model (DEM) files from the USGS. The files used for this modeling analysis are listed below in Table 3.4.

<sup>1</sup> Per 40 CFR 51 Appendix W "Guideline on Air Quality Models" Section 8.2.8, the urban/rural classification is determined based on the land use classification of the area that is circumscribed by a 3 kilometer radius about the source. If at least 50 percent of the land is commercial, heavy industrial, light-medium industry, close packed single family dwellings with no driveways, or older style, multi-family dwellings the urban dispersion coefficients may be used. Otherwise the default rural dispersion coefficients shall be used.

**TABLE 3-4. USGS DIGITAL ELEVATION MODEL (DEM) FILES**

USGS QUADRANGLE TITLE	DEM FILE NAME
Kenyon, Idaho	42113D7.DEM
Burley, Idaho	42113E7.DEM
Burley Southwest, Idaho	42113E8.DEM

### **3.5 Ambient Air Boundary**

The NAAQS and ambient air increments apply to air that is considered ambient. In accordance with the Guideline, ambient air is that portion of the atmosphere, external to buildings, to which the general public has access. In most cases, ambient air boundaries are delineated based on the location of a fence or other significant physical barrier that restricts public access. The proposed site will be fenced. As a result, the ambient air boundary for the facility was assumed to follow the fence line.

### **3.6 Receptor Grid**

ISCST3 model concentrations are estimated at discrete receptor locations. The discrete Cartesian receptor grid is designed to identify maximum predicted impacts due to the proposed facility. The following receptor systems were used in this analysis:

- A fenceline receptor grid with receptors placed along the fenceline at an interval distance of 25 meters;
- A tight Cartesian grid extending 200 meters from the site in every direction with receptors located at an interval distance of 25 meters;
- A fine Cartesian grid extending 500 meters from the site in every direction with receptors located at an interval distance of 50 meters;
- A medium Cartesian grid extending 2 kilometers from the site in every direction with receptors located at an interval distance of 100 meters; and
- A coarse Cartesian grid extending 4.5 kilometers from the site in every direction with receptors located at an interval distance of 250 meters.

### **3.7 Meteorological Data**

The dispersion modeling analysis was performed using ISC-ready meteorological data provided by the IDEQ for Heyburn, Idaho, which is approximately 10 kilometers from the proposed site. These data included one year of hourly onsite surface data acquired by the Simplot Company and had been approved by the IDEQ. It should be noted, per discussion with IDEQ, that since these data have some missing information, the non-regulatory option for missing data was used (see Section 3.4).

### 3.8 Building Downwash

Emissions modeled from the Facility were evaluated to determine if the emissions plume may become entrained in turbulent wakes, thus resulting in potentially higher ambient air impacts. These wake effects, also known as downwash, are the result of air flowing around large buildings and structures creating areas, or "zones", of turbulent airflow.

The minimum stack height necessary to avoid downwash effects, known as Good Engineering Practice (GEP) stack height, is defined by the following equation.

$$H_{GEP} = H + 1.5L \quad (\text{Equation 1})$$

Where,  $H_{GEP}$  = GEP stack height  
 $H$  = structure or building height  
 $L$  = the lesser of the structure height or projected width

This equation applies only to stacks located within 5L of a downwash structure. Stacks located more than 5L from the downwash structure are not subject to the wake effects of that structure. If more than one stack at the facility is modeled, the equation must be successively applied to each stack. If more than one structure is modeled, the equation must also be successively applied to each structure. The building downwash determination for this modeling analysis is performed for each stack and structure using the USEPA-approved Building Profile Input Program (BPIPPRM) that is compatible with ISC-PRIME. BPIPPRM will perform the aforementioned calculation for every 10-degree directional interval starting at 10 degrees and going clockwise to 360 (due North).

### 3.9 GEP Stack Height Determinations

As specified by the USEPA in Appendix W of 40 CFR 51 Section 7.2.5, no stack height credit may be given in excess of the GEP stack height for any source when determining emission limitations for compliance with the NAAQS and PSD increments. As defined in 40 CFR 51.100, GEP stack height is the greater of 65 meters or the height determined using the equation discussed in Section 3.9. The stack heights used for the dispersion modeling analysis are well below 65 meters. Therefore, the emission rates and stack heights used in the modeling analysis are appropriate for demonstrating compliance with the NAAQS. Building downwash has been calculated and included in the dispersion modeling for all stacks as mentioned in Section 3.9.

## 4.0 DISPERSION MODELING RESULTS

### 4.1 Significance Modeling Results

The proposed PM<sub>10</sub> and NO<sub>x</sub> emissions were modeled and compared to the SCLs. Since the impacts from the Facility were predicted to be greater than the SCLs for PM<sub>10</sub> and NO<sub>x</sub>, a full impacts analysis was performed, which requires the addition of nearby sources identified by the IDEQ as significant sources of air contaminants.

The proposed acetaldehyde, arsenic, benzene, cadmium, formaldehyde, nickel, and total PAHs emissions were modeled and compared to their AACs since these TAPs emissions are above their ELs. The dispersion modeling indicated that the TAPs impacts are below the AACs, as shown in Table A-4 of Appendix A. Therefore, the proposed construction of the Facility complies with the IDAPA's TAPs AACs.

### 4.2 Nearby Sources

Facilities that must demonstrate compliance with the NAAQS must also include any sources within 1,000 meters of the proposed site as indicated by IDEQ staff<sup>2</sup>. However, based on correspondence with IDEQ staff<sup>3</sup>, no significant sources of PM<sub>10</sub> and NO<sub>x</sub> located near the Facility were identified; thus, there were no nearby sources included in the full impacts analysis.

### 4.3 Background Concentrations

The existing ambient air concentrations must be accounted for when demonstrating compliance with the NAAQS. The existing ambient air concentrations (often referred to as background concentrations) are often estimated using ambient air monitoring data from the air basin that the proposed site is located. This method of estimating the background concentration is conservative because it accounts for the existing air pollutant concentrations including existing stationary source impacts. Therefore, FIA that use the ambient air monitoring data as background concentrations and include nearby sources are double counting the configuration of actual emissions from existing facilities. For this modeling analysis, the background concentration is estimated based on information supplied to NRG by the IDEQ. The background concentrations used in this modeling analysis are shown in Table 4.1.

**TABLE 4-1. BACKGROUND CONCENTRATIONS FOR BURLEY, IDAHO**

Pollutant	Averaging Period	Concentration (µg/m <sup>3</sup> )
PM <sub>10</sub>	24-Hour	76

<sup>2</sup> Per a October 20, 2006 email from Kevin Schilling, at IDEQ, to Warner Reeser, at Natural Resource Group, "Re: Burley Protocol."

<sup>3</sup> Per a October 23, 2006 email from Kevin Schilling, at IDEQ, to Warner Reeser, at Natural Resource Group, "Re: Burley Protocol."

	Annual	27
NO <sub>x</sub>	Annual	17

#### **4.4 NAAQS Analysis**

As documented in the modeling results summary table (Table A-4 of Appendix A), the total impacts of PM<sub>10</sub> and NO<sub>x</sub>, which includes the modeled impacts from the proposed Facility and existing background concentrations of the pollutants in the Burley, Idaho area, are below the applicable NAAQS for each averaging period. Therefore, the proposed project complies with the PM<sub>10</sub> and NO<sub>2</sub> NAAQS.

## **5.0 MODELING RUNS AND OUTPUT**

The ISCST3 input, output, meteorological data, and BPIP files for the modeling analysis are included on the CD-ROM found in Appendix C.

## Appendix A – Model Inputs and Results

TABLE A-1

Facility Emissions Summary Table for Modeled Pollutants<sup>1</sup>

Pacific Ethanol Magic Valley, LLC - Burley, Idaho

Stack ID	Facility Emission Sources	Pollutant Emission Rates								
		PM <sub>10</sub> (g/s)	NO <sub>x</sub> (g/s)	Arsenic (g/s)	Benzene (g/s)	Cadmium (g/s)	Nickel (g/s)	Formaldehyde (g/s)	Acetaldehyde (g/s)	Total PAHs (g/s)
SV01	Corn Receiving Baghouse	1.08E-01								
SV02	Corn Handling Baghouse	5.41E-02								
SV03	Corn Bin #1	4.32E-03								
SV04	Corn Bin #2	4.32E-03								
SV05	Surge Bin Spot Filters	2.30E-03								
SV06	Hammermilling Baghouse	4.86E-02								
SV09	Boiler #1	7.11E-02	4.76E-01	1.87E-06	1.96E-05	1.03E-05	1.96E-05	6.99E-04		3.70E-06
SV10	Boiler #2	7.11E-02	4.76E-01	1.87E-06	1.96E-05	1.03E-05	1.96E-05	6.99E-04		3.70E-06
SV11	Boiler #3	7.11E-02	4.76E-01	1.87E-06	1.96E-05	1.03E-05	1.96E-05	6.99E-04		3.70E-06
COOL1	Cooling Tower 1	3.16E-02								
COOL2	Cooling Tower 2	3.16E-02								
COOL3	Cooling Tower 3	3.16E-02								
SV12	RCO	5.75E-03	3.77E-02	1.48E-07	3.02E-03	8.14E-07	1.56E-06	1.24E-04	8.11E-02	
SV13	Distillation							4.12E-05	4.03E-02	
Total		0.54	1.47	5.75E-06	3.08E-03	3.16E-05	6.04E-05	2.26E-03	1.21E-01	1.11E-05

**NOTES:**

1. Emissions included in this table are based on information represented in the revision to the November 2006 Application for Authority to Construct.

**Table A-2**  
**Modeled Stack Parameters Summary Table - Point Sources**  
**Pacific Ethanol Magic Valley, LLC - Burley, Idaho**

Stack ID	Facility Emission Sources	Source Location			Source Parameters <sup>1</sup>			
		UTM E (m)	UTM N (m)	Elevation (m)	Stack Ht (m)	Temp (°K)	Exit Velocity (m/s)	Diameter (m)
SV01	Corn Receiving Baghouse	268655.00	4711403.00	1287.48	19.8	0	30.593	0.4481
SV02	Corn Handling Baghouse	268658.28	4711420.50	1287.48	19.8	0	30.593	0.4481
SV03	Corn Bin #1	268660.25	4711437.00	1287.48	20.4	0	2.109	0.3414
SV04	Corn Bin #2	268655.00	4711403.00	1287.48	20.4	0	2.109	0.3414
SV05	Surge Bin Spot Filters	268675.25	4711446.50	1287.48	9.1	0	0.586	0.4572
SV06	Hammermilling Baghouse	268660.25	4711459.00	1287.48	18.3	0	6.612	0.9144
SV09	Boiler #1	268792.13	4711561.00	1287.48	13.7	427.59	11.505	0.9144
SV10	Boiler #2	268800.44	4711560.50	1287.48	13.7	427.59	11.505	0.9144
SV11	Boiler #3	268809.06	4711561.00	1287.48	13.7	427.59	11.505	0.9144
COOL1	Cooling Tower 1	268737.19	4711605.00	1287.48	10.4	294.26	16.069	2.4384
COOL2	Cooling Tower 2	268740.53	4711604.00	1287.48	10.4	294.26	16.069	2.4384
COOL3	Cooling Tower 3	268746.09	4711604.00	1287.48	10.4	294.26	16.069	2.4384
SV12	RCO <sup>2</sup>	268834.27	4711352.82	1287.00	17.4	326.48	4.284	0.9144
SV13		268721.66	4711346.19	1287.48	13.6	296.21	1.51	0.4054

**NOTES:**

1. The stack parameters were provided by Delta T and are included in the November 2006 Application for Authority to Construct.
2. The top of the RCO stack will be angled at 45° to act as a rain cap. Half of the exit velocity was used to account for the vertical component of the emission stream.

**Table A-3**  
**Building and Tank Parameters Summary Table**  
**Pacific Ethanol Magic Valley, LLC - Burley, Idaho**

**Buildings**

Building	No. of Tiers	Base Elevation (ft)	Tier Height (m)	No. of Corners	Corner	UTM E (m)	UTM N (m)
Boiler	1	4224	12.19	4	1	268786.5	4711577.5
					2	268815.0	4711577.5
					3	268815.0	4711555.0
					4	268786.5	4711555.0
MCC	1	4224	6.10	4	1	268815.0	4711577.0
					2	268827.5	4711577.0
					3	268827.5	4711555.0
					4	268815.5	4711555.0
Administrative	1	4224	6.10	4	1	268793.9	4711439.5
					2	268793.9	4711470.0
					3	268822.9	4711469.0
					4	268822.9	4711439.5
Process	1	4224	18.29	4	1	268745.1	4711444.0
					2	268747.4	4711537.5
					3	268778.1	4711536.5
					4	268774.9	4711444.0
Fermentation	1	4224	7.01	4	1	268716.5	4711434.0
					2	268719.8	4711538.0
					3	268747.7	4711537.0
					4	268745.1	4711433.0
Cooling Tower	1	4224	10.36	4	1	268748.3	4711609.5
					2	268748.3	4711603.5
					3	268759.6	4711603.5
					4	268759.0	4711610.0
DD&E	1	4224	12.19	4	1	268736.4	4711580.5
					2	268735.7	4711557.5
					3	268760.9	4711557.0
					4	268759.6	4711580.5

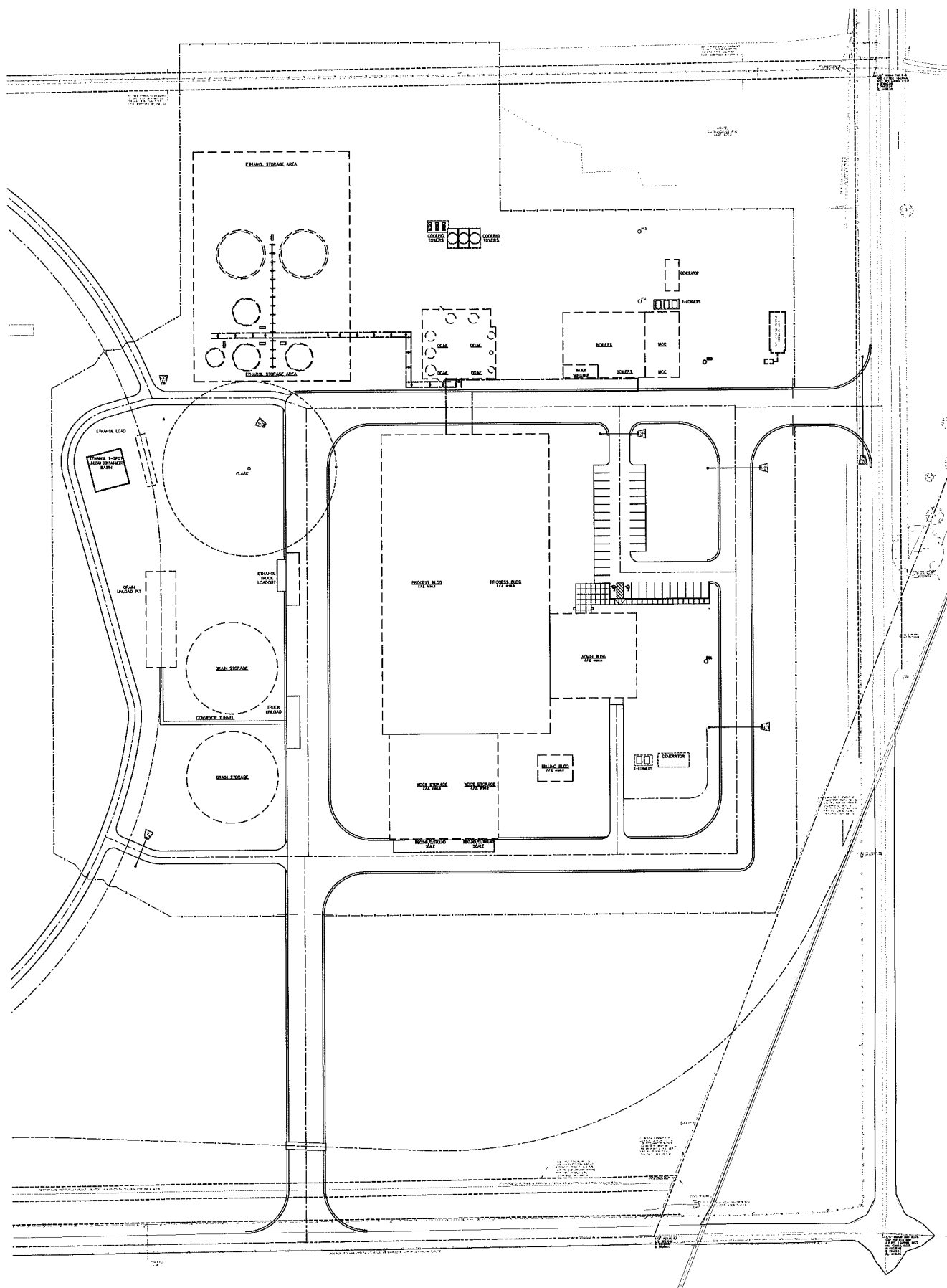
**Tanks and Silos**

Tank/Silo	Base Elevation (ft)	UTM E Center (m)	UTM N Center (m)	Tank Height (m)	Tank Diameter (m)
Grain #1	4224	268658.6	4711437.5	25.3	18.3
Grain #2	4224	268655.0	4711403.5	25.3	18.3
Tank 01	4224	268705.2	4711566.5	14.5	7.6
Tank 02	4224	268693.5	4711567.5	7.3	6.2
Tank 03	4224	268675.0	4711567.5	14.5	7.6
Tank 04	4224	268694.2	4711582.5	14.5	7.6
Tank 05	4224	268696.3	4711603.0	19.0	12.2
Tank 06	4224	268675.0	4711603.5	19.0	12.2

**Table A-4**  
**Modeled Results Summary Table**  
**Pacific Ethanol Magic Valley, LLC - Burley, Idaho**

Pollutant	Averaging Period	Impacts Summary				
		Modeled ( $\mu\text{g}/\text{m}^3$ )	Background ( $\mu\text{g}/\text{m}^3$ )	Total ( $\mu\text{g}/\text{m}^3$ )	IDAPA's AAC ( $\mu\text{g}/\text{m}^3$ )	NAAQS ( $\mu\text{g}/\text{m}^3$ )
PM <sub>10</sub>	24-Hour	13.1747	76	88.1747	---	150
	Annual	3.3911	27	30.3911	---	50
NO <sub>x</sub>	Annual	4.3485	17	21.3485	---	100
Acetaldehyde	Annual	0.2786	---	---	0.45	---
Arsenic	Annual	0.00002	---	---	0.00023	---
Benzene	Annual	0.0531	---	---	0.12	---
Cadmium	Annual	0.0001	---	---	0.00056	---
Formaldehyde	Annual	0.0311	---	---	0.077	---
Nickel	Annual	0.0002	---	---	0.0042	---
Total PAHs	Annual	0.00003	---	---	0.00034	---

## **Appendix B – Facility Plot Plan**



## **Appendix C – Modeling Files (CD-ROM)**

**Attachment B**  
**Revised Emission Calculations**

**Pacific Ethanol Magic Valley, LLC**  
**Limited Potential Emissions @ 60 million gallons ethanol production**

Stack/ Vent ID	Control Equipment ID	Emission Unit ID	Emission Sources Associated with Ethanol Operations	Criteria Pollutants (Limited Emissions)						
				PM (tpy)	PM <sub>10</sub> (tpy)	PM <sub>2.5</sub> (tpy)	SO <sub>2</sub> (tpy)	NO <sub>x</sub> (tpy)	VOC (tpy)	CO (tpy)
SV01	CE03	EU01	Truck Dump Pit	SV01	SV01	SV01	---	---	---	---
SV01	CE03	EU02	Rail Dump Pit	SV01	SV01	SV01	---	---	---	---
SV01	CE03	SV01	Corn Receiving Baghouse	3.75	3.75	3.75	---	---	---	---
SV02	CE02	EU03	Corn Conveyor #1	SV02	SV02	SV02	---	---	---	---
SV02	CE02	EU04	Corn Elevator #1	SV02	SV02	SV02	---	---	---	---
SV02	CE02	EU05	Corn Conveyor #2	SV02	SV02	SV02	---	---	---	---
SV02	CE02	EU06	Corn Elevator #2	SV02	SV02	SV02	---	---	---	---
SV02	CE02	EU07	Scalper	SV02	SV02	SV02	---	---	---	---
SV02	CE02	EU08	Corn Conveyor #3	SV02	SV02	SV02	---	---	---	---
SV02	CE02	SV02	Corn Handling Baghouse	1.88	1.88	1.88	---	---	---	---
SV03	CE03	EU09	Corn Bin #1	SV03	SV03	SV03	---	---	---	---
SV03	CE03	SV03	Corn Bin #1 Spot Filters	0.15	0.15	0.15	---	---	---	---
SV04	CE04	EU10	Corn Bin #2	SV04	SV04	SV04	---	---	---	---
SV04	CE04	SV04	Corn Bin #2 Spot Filters	0.15	0.15	0.15	---	---	---	---
SV05	CE05	EU11	Surge Bin	SV05	SV05	SV05	---	---	---	---
SV05	CE05	SV05	Surge Bin Spot Filters	0.08	0.08	0.08	---	---	---	---
SV06	CE06	EU12	Hammermill #1	SV06	SV06	SV06	---	---	---	---
SV06	CE06	EU13	Hammermill #2	SV06	SV06	SV06	---	---	---	---
SV06	CE06	EU14	Hammermill #3	SV06	SV06	SV06	---	---	---	---
SV06	CE06	SV06	Hammermilling Baghouse	1.69	1.69	1.69	---	---	---	---
SV12	CE07, CE09	EU16	Liquefaction Tank	---	---	---	---	---	SV12	---
SV12	CE07, CE09	EU17	Yeast Tank	---	---	---	---	---	SV12	---
SV12	CE07, CE09	EU18	Fermenter #1	---	---	---	---	---	SV12	---
SV12	CE07, CE09	EU19	Fermenter #2	---	---	---	---	---	SV12	---
SV12	CE07, CE09	EU20	Fermenter #3	---	---	---	---	---	SV12	---
SV12	CE07, CE09	EU21	Fermenter #4	---	---	---	---	---	SV12	---
SV12	CE07, CE09	EU22	Beerwell	---	---	---	---	---	SV12	---
SV12	CE07, CE09	EU23	De-gas Vessel	---	---	---	---	---	SV12	---
SV12	CE07	SV12	Fermentation Scrubber	---	---	---	---	---	SV12	---
SV13	CE08	EU15	Slurry Tank	---	---	---	---	---	SV13	---
SV13	CE08	EU24	Beer Stripper	---	---	---	---	---	SV13	---
SV13	CE08	EU25	Side Stripper	---	---	---	---	---	SV13	---
SV13	CE08	EU26	Rectifier Column	---	---	---	---	---	SV13	---
SV13	CE08	EU27	Molecular Sieve	---	---	---	---	---	SV13	---
SV13	CE08	EU28	200 Proof Condenser	---	---	---	---	---	SV13	---
SV13	CE08	EU29	Whole Stillage Tank	---	---	---	---	---	SV13	---
SV13	CE08	EU30	Process Condensate Tank	---	---	---	---	---	SV13	---
SV13	CE08	EU31	Evaporator	---	---	---	---	---	SV13	---
SV13	CE08	EU32	Centrifuge #1	---	---	---	---	---	SV13	---
SV13	CE08	EU33	Centrifuge #2	---	---	---	---	---	SV13	---
SV13	CE08	EU41	Centrifuge #3	---	---	---	---	---	SV13	---
SV13	CE08	EU42	Centrifuge #4	---	---	---	---	---	SV13	---
SV13	CE08	EU43	Centrifuge #5	---	---	---	---	---	SV13	---
SV13	CE08	EU34	Syrup Tank	---	---	---	---	---	SV13	---
SV13	CE08	EU35	Thin Stillage Tank	---	---	---	---	---	SV13	---
SV13	CE08	SV13	Vent Gas Scrubber	---	---	---	---	---	3.14	---
SV12	CE09	EU39	Ethanol Truck Loadout*	---	---	---	---	---	SV12	---
SV12	CE09	EU40	Ethanol Rail Loadout	---	---	---	---	---	SV12	---
SV12	CE09	SV12	Regenerative Catalytic Oxidizer**	0.20	0.20	0.20	0.02	1.31	22.19	2.25
SV09	---	EU36	Boiler #1	2.47	2.47	2.47	0.19	16.56	1.78	10.48
SV10	---	EU37	Boiler #2	2.47	2.47	2.47	0.19	16.56	1.78	10.48
SV11	---	EU38	Boiler #3	2.47	2.47	2.47	0.19	16.56	1.78	10.48
---	---	TK01	190 Proof Tank	---	---	---	---	---	0.05	---
---	---	TK02	Denaturant Tank	---	---	---	---	---	0.79	---
---	---	TK03	200 Proof Storage Tank	---	---	---	---	---	0.19	---
---	---	TK04	200 Proof Storage Tank	---	---	---	---	---	0.19	---
---	---	TK05	Denatured Ethanol	---	---	---	---	---	0.17	---
---	---	TK06	Denatured Ethanol	---	---	---	---	---	0.17	---
---	---	FS01	Truck Traffic	20.33	3.97	0.60	---	---	---	---
---	---	FS02	Fugitive Emissions from Grain Handling	6.44	1.43	1.43	---	---	---	---
---	---	FS03	Fugitive Emissions from Wet Cake Storage Pile / Loadout	---	---	---	---	---	2.67	---
---	---	FS04	Equipment Leaks	---	---	---	---	---	3.02	---
---	---	FS05	Cooling Towers	3.29	3.29	3.29	---	---	---	---
---	---	FS06	Fugitive Emissions from Grain Loadout	2.83	0.95	0.95	---	---	---	---
---	---	FS07	Fugitive Emissions from Grain Flaking	4.93	2.46	2.46	---	---	---	---
<b>TOTAL</b>				<b>53.11</b>	<b>27.41</b>	<b>24.03</b>	<b>0.60</b>	<b>50.98</b>	<b>37.95</b>	<b>33.69</b>

\* Ethanol Loadout is assumed to be 100% truck loadout for most conservative value.

\*\*The RCO controls emissions from the fermentation scrubber, as well as ethanol loadout.

**Pacific Ethanol Magic Valley, LLC  
Hazardous Air Pollutant Summary**

Pollutant	Boiler #1 (tpy)	Boiler #2 (tpy)	Boiler #3 (tpy)	RCO* (tpy)	Distillation Scrubber (tpy)	Tanks (tpy)	Wetcake (tpy)	Equipment Leaks (tpy)	Total (tpy)
2-Methylnaphthalene	7.79E-06	7.79E-06	7.79E-06	6.18E-07	---	---	---	---	2.40E-05
3-Methylchloranthrene	5.84E-07	5.84E-07	5.84E-07	4.64E-08	---	---	---	---	1.80E-06
7,12-Dimethylbenz(a)anthracene	5.19E-06	5.19E-06	5.19E-06	4.12E-07	---	---	---	---	1.60E-05
Acenaphthene	5.84E-07	5.84E-07	5.84E-07	4.64E-08	---	---	---	---	1.80E-06
Acenaphthylene	5.84E-07	5.84E-07	5.84E-07	4.64E-08	---	---	---	---	1.80E-06
Acetaldehyde	---	---	---	2.82E+00	2.71E+00	---	2.56E-02	6.04E-04	5.56E+00
Acrolein	---	---	---	2.45E-02	4.35E-01	---	4.22E-03	---	4.64E-01
Anthracene	7.79E-07	7.79E-07	7.79E-07	6.18E-08	---	---	---	---	2.40E-06
Arsenic	6.49E-05	6.49E-05	6.49E-05	5.15E-06	---	---	---	---	2.00E-04
Benzo(a)anthracene	5.84E-07	5.84E-07	5.84E-07	4.64E-08	---	---	---	---	1.80E-06
Benzene	6.82E-04	6.82E-04	6.82E-04	1.05E-01	---	2.02E-02	---	7.55E-03	1.35E-01
Benzo(a)pyrene	3.90E-07	3.90E-07	3.90E-07	3.09E-08	---	---	---	---	1.20E-06
Benzo(b)fluoranthene	5.84E-07	5.84E-07	5.84E-07	4.64E-08	---	---	---	---	1.80E-06
Benzo(g,h,i)perylene	3.90E-07	3.90E-07	3.90E-07	3.09E-08	---	---	---	---	1.20E-06
Benzo(k)fluoranthene	5.84E-07	5.84E-07	5.84E-07	4.64E-08	---	---	---	---	1.80E-06
Beryllium	3.90E-06	3.90E-06	3.90E-06	3.09E-07	---	---	---	---	1.20E-05
Cadmium	3.57E-04	3.57E-04	3.57E-04	2.83E-05	---	---	---	---	1.10E-03
Carbon Disulfide	---	---	---	1.05E-04	---	4.05E-04	---	6.04E-05	5.70E-04
Chromium	4.54E-04	4.54E-04	4.54E-04	3.61E-05	---	---	---	---	1.40E-03
Chrysene	5.84E-07	5.84E-07	5.84E-07	4.64E-08	---	---	---	---	1.80E-06
Cobalt	2.73E-05	2.73E-05	2.73E-05	2.16E-06	---	---	---	---	8.40E-05
Cumene	---	---	---	2.10E-04	---	8.09E-05	---	3.02E-03	3.31E-03
Dibenzo(a,h)anthracene	3.90E-07	3.90E-07	3.90E-07	3.09E-08	---	---	---	---	1.20E-06
Dichlorobenzene	3.90E-04	3.90E-04	3.90E-04	3.09E-05	---	---	---	---	1.20E-03
Ethyl benzene	---	---	---	3.15E-02	---	1.21E-02	---	1.51E-04	4.38E-02
Fluoranthene	9.74E-07	9.74E-07	9.74E-07	7.73E-08	---	---	---	---	3.00E-06
Fluorene	9.09E-07	9.09E-07	9.09E-07	7.21E-08	---	---	---	---	2.80E-06
Formaldehyde	2.43E-02	2.43E-02	2.43E-02	4.2958E-03	1.43E-03	---	5.12E-02	---	1.30E-01
Formic Acid	---	---	---	2.12E+00	3.67E-03	---	---	---	2.12E+00
Hexane	5.84E-01	5.84E-01	5.84E-01	7.79E-02	---	1.21E-02	---	1.51E-01	1.99E+00
Indeno(1,2,3-cd)pyrene	5.84E-07	5.84E-07	5.84E-07	4.64E-08	---	---	---	---	1.80E-06
Manganese	1.23E-04	1.23E-04	1.23E-04	9.79E-06	---	---	---	---	3.80E-04
Mercury	8.44E-05	8.44E-05	8.44E-05	6.70E-06	---	---	---	---	2.60E-04
Methanol	---	---	---	6.39E-02	5.09E-03	---	3.20E-02	6.04E-04	1.02E-01
Naphthalene	1.98E-04	1.98E-04	1.98E-04	1.57E-05	---	---	---	---	6.10E-04
Nickel	6.82E-04	6.82E-04	6.82E-04	5.41E-05	---	---	---	---	2.10E-03
Phenanthrene	5.52E-06	5.52E-06	5.52E-06	4.38E-07	---	---	---	---	1.70E-05
Pyrene	1.62E-06	1.62E-06	1.62E-06	1.29E-07	---	---	---	---	5.00E-06
Selenium	7.79E-06	7.79E-06	7.79E-06	6.18E-07	---	---	---	---	2.40E-05
Toluene	1.10E-03	1.10E-03	1.10E-03	1.05E-01	---	4.05E-02	---	1.51E-02	1.64E-01
Xylenes	---	---	---	1.05E-01	---	4.86E-02	---	1.51E-03	1.55E-01
<b>Total</b>	<b>0.61</b>	<b>0.61</b>	<b>0.61</b>	<b>5.46</b>	<b>3.15</b>	<b>0.13</b>	<b>0.11</b>	<b>0.18</b>	<b>10.88</b>

\*The RCO HAPs include fermentation and ethanol loadout HAPs.

**Pacific Ethanol Magic Valley, LLC**  
**Grain Hammermilling Emission Calculations**

**Process Data**

Grain Required for 60.00 MMgal EtOH:	22.5 MM bushels/yr =	
Grain Density:	56 lb/bushel	
Total Grain Receiving Throughput:	629,213 tpy =	71.8 ton/hr
 Total Grain Loadout Throughput:	 1,500 tons/day	 62.5 ton/hr
	547,500 tpy	
 Wet Cake:		140,289 lb/hr
Wet Cake Handling (32% solids):	140,289 lb/hr ÷ 2000 lb/ton =	70.1 ton/hr
 Grain Haul Out:		
Total Grain Delivery Throughput:		

**Emission Calculation Method**

Uncontrolled Potential Emissions = Flow Rate (DSCFM) · Emission Factor (gr/DSCF) ÷ 7,000 gr/lb · 60 min/hr

**PM/PM<sub>10</sub>/PM<sub>2.5</sub> Emissions from Grain Receiving, Handling, and Hammermilling**

Stack ID	Emission Source	Flow Rate (DSCFM)	Emission Factor (gr/DSCF)	Controlled Emissions	
				(lb/hr)	(tpy)
SV01	Corn Receiving Baghouse	20,000	0.005	0.86	3.75
SV02	Corn Handling Baghouse	10,000	0.005	0.43	1.88
SV03	Corn Bin #1 Spot Filters	400	0.01	0.03	0.15
SV04	Corn Bin #2 Spot Filters	400	0.01	0.03	0.15
SV05	Surge Bin Spot Filters	200	0.01	0.02	0.08
SV06	Hammermilling Baghouse	9,000	0.005	0.39	1.69

**Emission Calculation Method**

Uncontrolled Potential Emissions = Throughput (ton/hr) · Emission Factor (lb/ton) · 8,760 hr/yr · 1 ton/2000 lb

**Fugitive PM Emissions from Grain Handling, Loadout and Flaking**

Stack ID	Emission Source	Throughput (ton/hr)	AP-42* Emission Factor (lb/ton)	Uncontrolled PM Emissions		Capture Efficiency	Uncaptured PM Emissions	
				(lb/hr)	(tpy)		(lb/hr)	(tpy)
FS02	Fugitive Emissions from Grain Handling	420.0	0.035	14.70	64.39	10% uncaptured	1.47	6.44
FS06	Fugitive Emissions from Grain Loadout	75.0	0.086	6.45	28.25	10% uncaptured	0.65	2.83
FS07	Fugitive Emissions from Grain Flaking	75.0	0.15	11.25	49.28	10% uncaptured	1.13	4.93

\*Emission factors taken from AP-42 Section 9.9.1, 6/98.

**Fugitive PM<sub>10</sub>/PM<sub>2.5</sub> Emissions from Grain Handling, Loadout and Flaking**

Stack ID	Emission Source	Throughput (ton/hr)	AP-42* Emission Factor (lb/ton)	Uncontrolled PM <sub>10</sub> /PM <sub>2.5</sub> Emissions		Capture Efficiency	Uncaptured PM <sub>10</sub> /PM <sub>2.5</sub> Emissions	
				(lb/hr)	(tpy)		(lb/hr)	(tpy)
FS02	Fugitive Emissions from Grain Handling	420.0	0.0078	3.28	14.35	10% uncaptured	0.33	1.43
FS06	Fugitive Emissions from Grain Loadout	75.0	0.029	2.18	9.53	10% uncaptured	0.22	0.95
FS07	Fugitive Emissions from Grain Flaking	75.0	0.075	5.63	24.64	10% uncaptured	0.56	2.46

\*Emission factors taken from AP-42 Section 9.9.1, 6/98.

## Pacific Ethanol Magic Valley, LLC Fermentation Process

### Process Data

VOC and HAP emissions are controlled by the CO<sub>2</sub> scrubber and the RCO

Emissions are estimated based on stack test data at Ace Ethanol in Stanely, WI on Sept. 14-16, 2004.  
Emissions are based on Method 18 test data for the plant and scaled linearly based on production capacity.

ACE Ethanol Production Rate at Test = 44.86 MMGal/yr

### **Potential VOC Emissions**

	lb/hr	ton/yr
Tested Emission Rate (as propane):	0.82	3.61
Tested Emission Rate (as VOC)*:	1.35	5.91
Tested Uncontrolled VOC Emission Rate (99.2% Control):	168.73	739.04
Scaled VOC uncontrolled emission rate for Magic Valley:	413.74	1,812.17
Total VOC Control (Scrubber and RCO):	99.0%	
<b>Fermentation Process Controlled Potential Emissions</b>	<b>4.14</b>	<b>18.12</b>

\* Propane to VOC conversion = 0.8234 lb propane/hr ÷ 1.22 (propane to C) · 2 (C to VOC)

### **Potential HAP Emissions**

HAP	Speciated Test Rate (lb/hr)	Scaling Factor for Magic Valley <sup>1</sup>	Controlled Emission Rate	
			(lb/hr)	(ton/yr) <sup>2</sup>
Acetaldehyde <sup>2</sup>	0.2607	1.34	0.35	2.82
Acrolein <sup>2</sup>	0.0028	1.34	0.004	0.02
Formic Acid	0.3613	1.34	0.48	2.12
Formaldehyde	0.0003	1.34	0.000	0.0024
Methanol	0.0109	1.34	0.015	0.06
<b>Total</b>				<b>5.03</b>

[1] Scaling factor accounts for the scaling of the production rate of ACE Ethanol at the time of test to the proposed facility production rate.

[2] Pollutant ton/yr emissions contain a margin of safety.

# **Pacific Ethanol Magic Valley, LLC** **Distillation Process**

## **Process Data**

Emissions controlled by the vent gas scrubber

Emissions are estimated based on stack test data at Ace Ethanol in Stanely, WI on Sept. 14-16, 2004. Emissions are based on Method 18 test data for the plant and scaled linearly based on production capacity.

ACE Ethanol Production Rate at Test = 40.78 MMGal/yr

Control Efficiency: 97%

## **Potential VOC Emissions**

Ace Ethanol 2004 stack test data:

Uncontrolled emission rate scaled as VOC 12.50 lb/hr  
 $= 0.12 \text{ lb/hr} \div 2.1 \text{ (propane to VOC ratio)}$

Ace Ethanol production rate = 40.79 MMGal/yr

Uncontrolled Estimated Emissions = 18.39 lb/hr  
 $= 12.50 \text{ lb/hr} * (60/40.79)$

Controlled Potential Emissions =  $18.39 \text{ lb/hr} \cdot (1-0.00) =$  0.55 lb/hr

Annual VOC emission rate =  $0.55 \text{ lb VOC/hr} \cdot 8760 \text{ hr/yr} \div 2000 \text{ lb/ton} =$  2.42 ton/yr

## **Proposed VOC Limit\*:**

\*Proposed limit includes a safety factor.

<b>0.72 lb/hr = 3.14 tpy</b>
------------------------------

## **Potential HAP Emissions**

HAP	Speciated Test Rate (lb/hr)	Scaling Factor for Magic Valley <sup>1</sup>	Controlled	Emission
			Rate (lb/hr)	(ton/yr) <sup>2</sup>
Acetaldehyde <sup>2</sup>	0.22	1.47	0.32	2.71
Acrolein <sup>2</sup>	0.05	1.47	0.07	0.43
Formaldehyde	0.0002	1.47	0.0002	0.001
Formic Acid	0.0006	1.47	0.0008	0.0037
Methanol	0.0008	1.47	0.0012	0.01
<b>Total</b>				<b>3.15</b>

[1] Scaling factor accounts for the scaling of the production rate of ACE Ethanol at the time of test to the proposed facility production rate.

[2] Pollutant ton/yr emissions contain a margin of safety.

**Pacific Ethanol Magic Valley, LLC  
RCO Combustion Calculations**

**RCO**

Max Firing Capacity 6,000,000 BTU/hr  
Usable Firing Capacity: 6,000,000 BTU/hr

Primary Fuel Type: Natural Gas  
Heat Value: 1,020 BTU/cf  
Fuel Burning Capacity: 5,882 cf/hr

Pollutant	Emission Factor* (lb/MMBtu)	Emission Rate (lb/hr)	Max. Uncontrolled Emissions (tons/yr)
PM	0.00775	0.047	0.20
PM <sub>10</sub>	0.00775	0.047	0.20
Sox	0.00059	0.0035	0.02
NO <sub>x</sub> **	0.05000	0.300	1.31
VOC**	0.07500	0.450	1.97
CO	0.08568	0.514	2.25

\*Emission Factors from Fifth Edition AP-42, Section 1.4, "Natural Gas Combustion", 10/96.

\*\*Emission Factor provided by manufacturer

**Pacific Ethanol Magic Valley, LLC**  
**RCO HAP Calculations**

**HAP Emissions**

Pollutant	Emission Factor* (lb/MMBtu)	Potential Emissions	
		(lb/hr)	(tpy)
2-Methylnaphthalene	2.35E-08	1.4E-07	6.2E-07
3-Methylchloranthrene	1.76E-09	1.1E-08	4.6E-08
7,12-Dimethylbenz(a)anthracene	1.57E-08	9.4E-08	4.1E-07
Acenaphthene	1.76E-09	1.1E-08	4.6E-08
Acenaphthylene	1.76E-09	1.1E-08	4.6E-08
Anthracene	2.35E-09	1.4E-08	6.2E-08
Arsenic	1.96E-07	1.2E-06	5.2E-06
Benzo(a)anthracene	1.76E-09	1.1E-08	4.6E-08
Benzene	2.06E-06	1.2E-05	5.4E-05
Benzo(a)pyrene	1.18E-09	7.1E-09	3.1E-08
Benzo(b)fluoranthene	1.76E-09	1.1E-08	4.6E-08
Benzo(g,h,i)perylene	1.18E-09	7.1E-09	3.1E-08
Benzo(k)fluoranthene	1.76E-09	1.1E-08	4.6E-08
Beryllium	1.18E-08	7.1E-08	3.1E-07
Cadmium	1.08E-06	6.5E-06	2.8E-05
Chromium	1.37E-06	8.2E-06	3.6E-05
Chrysene	1.76E-09	1.1E-08	4.6E-08
Cobalt	8.24E-08	4.9E-07	2.2E-06
Dibenzo(a,h)anthracene	1.18E-09	7.1E-09	3.1E-08
Dichlorobenzene	1.18E-06	7.1E-06	3.1E-05
Fluoranthene	2.94E-09	1.8E-08	7.7E-08
Fluorene	2.75E-09	1.6E-08	7.2E-08
Formaldehyde	7.35E-05	4.4E-04	1.9E-03
Hexane	1.76E-03	1.1E-02	4.6E-02
Indeno(1,2,3-cd)pyrene	1.76E-09	1.1E-08	4.6E-08
Manganese	3.73E-07	2.2E-06	9.8E-06
Mercury	2.55E-07	1.5E-06	6.7E-06
Naphthalene	5.98E-07	3.6E-06	1.6E-05
Nickel	2.06E-06	1.2E-05	5.4E-05
Phenanthrene	1.67E-08	1.0E-07	4.4E-07
Pyrene	4.90E-09	2.9E-08	1.3E-07
Selenium	2.35E-08	1.4E-07	6.2E-07
Toluene	3.33E-06	2.0E-05	8.8E-05
<b>Total</b>			<b>0.05</b>

\*Emission Factor is from AP-42, 5th Edition, Section 1.4, "External Combustion Sources," 7/98

**Pacific Ethanol Magic Valley, LLC  
Combustion Calculations**

<b>Boiler #1</b>	<b>Natural Gas</b>
Firing Capacity:	75.6 MMBTU/hr
Heat Value:	1,020 BTU/cf
Fuel Burning Capacity:	0.0741 MMcf/hr
Stack Gas Flow	15,678 dscfm

Pollutant	Emission Factor* (lb/MMBtu)	Emission Rate (lb/hr)	Max. Uncontrolled Emissions (tpy)
PM	7.45E-03	0.56	2.47
PM <sub>10</sub> /PM <sub>2.5</sub>	7.45E-03	0.56	2.47
SO <sub>2</sub>	5.88E-04	0.04	0.19
NO <sub>x</sub> **	5.00E-02	3.78	16.56
VOC	5.39E-03	0.41	1.78
CO***	3.23E-05	2.39	10.48

\*Emission Factors from Fifth Edition AP-42, Section 1.4, "Natural Gas Combustion", 7/98.

\*\*Based on manufacturer guarantee.

\*\*\*Based on manufacturer estimated emissions of 50 ppm,v, given in lb/cf.

**Pacific Ethanol Magic Valley, LLC  
Combustion Calculations**

<b>Boiler #2</b>	<b>Natural Gas</b>
Firing Capacity:	75.6 MMBTU/hr
Heat Value:	1,020 BTU/cf
Fuel Burning Capacity:	0.0741 MMCf/hr
Stack Gas Flow	15,678 dscfm

Pollutant	Emission Factor* (lb/MMBtu)	Emission Rate (lb/hr)	Max. Uncontrolled Emissions (tpy)
PM	7.45E-03	0.56	2.47
PM <sub>10</sub> /PM <sub>2.5</sub>	7.45E-03	0.56	2.47
SO <sub>2</sub>	5.88E-04	0.04	0.19
NO <sub>x</sub> **	5.00E-02	3.78	16.56
VOC	5.39E-03	0.41	1.78
CO***	3.23E-05	2.39	10.48

\*Emission Factors from Fifth Edition AP-42, Section 1.4, "Natural Gas Combustion", 7/98.

\*\*Based on manufacturer guarantee.

\*\*\*Based on manufacturer estimated emissions of 50 ppm,v, given in lb/cf.

**Pacific Ethanol Magic Valley, LLC  
Combustion Calculations**

<b>Boiler #3</b>	<b>Natural Gas</b>
Firing Capacity:	75.6 MMBTU/hr
Heat Value:	1,020 BTU/cf
Fuel Burning Capacity:	0.0741 MMcf/hr
Stack Gas Flow	15,678 dscfm

Pollutant	Emission Factor* (lb/MMBtu)	Emission Rate (lb/hr)	Max. Uncontrolled Emissions (tpy)
PM	7.45E-03	0.56	2.47
PM <sub>10</sub> /PM <sub>2.5</sub>	7.45E-03	0.56	2.47
SO <sub>2</sub>	5.88E-04	0.04	0.19
NO <sub>x</sub> **	5.00E-02	3.78	16.56
VOC	5.39E-03	0.41	1.78
CO***	3.23E-05	2.39	10.48

\*Emission Factors from Fifth Edition AP-42, Section 1.4, "Natural Gas Combustion", 7/98.

\*\* Based on manufacturer guarantee.

\*\*\*Based on manufacturer estimated emissions of 50 ppm,v, given in lb/cf.

**Pacific Ethanol Magic Valley, LLC  
Combustion Calculations**

**HAP Calculations**

Pollutant	Emission Factor* (lb/MMBtu)	Boiler #1		Boiler #2		Boiler #3	
		Potential Emissions		Potential Emissions		Potential Emissions	
		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
2-Methylnaphthalene	2.35E-08	1.8E-06	7.8E-06	1.8E-06	7.8E-06	1.8E-06	7.8E-06
3-Methylchloranthrene	1.76E-09	1.3E-07	5.8E-07	1.3E-07	5.8E-07	1.3E-07	5.8E-07
7,12-Dimethylbenz(a)anthracene	1.57E-08	1.2E-06	5.2E-06	1.2E-06	5.2E-06	1.2E-06	5.2E-06
Acenaphthene	1.76E-09	1.3E-07	5.8E-07	1.3E-07	5.8E-07	1.3E-07	5.8E-07
Acenaphthylene	1.76E-09	1.3E-07	5.8E-07	1.3E-07	5.8E-07	1.3E-07	5.8E-07
Anthracene	2.35E-09	1.8E-07	7.8E-07	1.8E-07	7.8E-07	1.8E-07	7.8E-07
Arsenic	1.96E-07	1.5E-05	6.5E-05	1.5E-05	6.5E-05	1.5E-05	6.5E-05
Benzo(a)anthracene	1.76E-09	1.3E-07	5.8E-07	1.3E-07	5.8E-07	1.3E-07	5.8E-07
Benzene	2.06E-06	1.6E-04	6.8E-04	1.6E-04	6.8E-04	1.6E-04	6.8E-04
Benzo(a)pyrene	1.18E-09	8.9E-08	3.9E-07	8.9E-08	3.9E-07	8.9E-08	3.9E-07
Benzo(b)fluoranthene	1.76E-09	1.3E-07	5.8E-07	1.3E-07	5.8E-07	1.3E-07	5.8E-07
Benzo(g,h,i)perylene	1.18E-09	8.9E-08	3.9E-07	8.9E-08	3.9E-07	8.9E-08	3.9E-07
Benzo(k)fluoranthene	1.76E-09	1.3E-07	5.8E-07	1.3E-07	5.8E-07	1.3E-07	5.8E-07
Beryllium	1.18E-08	8.9E-07	3.9E-06	8.9E-07	3.9E-06	8.9E-07	3.9E-06
Cadmium	1.08E-06	8.2E-05	3.6E-04	8.2E-05	3.6E-04	8.2E-05	3.6E-04
Chromium	1.37E-06	1.0E-04	4.5E-04	1.0E-04	4.5E-04	1.0E-04	4.5E-04
Chrysene	1.76E-09	1.3E-07	5.8E-07	1.3E-07	5.8E-07	1.3E-07	5.8E-07
Cobalt	8.24E-08	6.2E-06	2.7E-05	6.2E-06	2.7E-05	6.2E-06	2.7E-05
Dibenzo(a,h)anthracene	1.18E-09	8.9E-08	3.9E-07	8.9E-08	3.9E-07	8.9E-08	3.9E-07
Dichlorobenzene	1.18E-06	8.9E-05	3.9E-04	8.9E-05	3.9E-04	8.9E-05	3.9E-04
Fluoranthene	2.94E-09	2.2E-07	9.7E-07	2.2E-07	9.7E-07	2.2E-07	9.7E-07
Fluorene	2.75E-09	2.1E-07	9.1E-07	2.1E-07	9.1E-07	2.1E-07	9.1E-07
Formaldehyde	7.35E-05	5.6E-03	2.4E-02	5.6E-03	2.4E-02	5.6E-03	2.4E-02
Hexane	1.76E-03	1.3E-01	5.8E-01	1.3E-01	5.8E-01	1.3E-01	5.8E-01
Indeno(1,2,3-cd)pyrene	1.76E-09	1.3E-07	5.8E-07	1.3E-07	5.8E-07	1.3E-07	5.8E-07
Manganese	3.73E-07	2.8E-05	1.2E-04	2.8E-05	1.2E-04	2.8E-05	1.2E-04
Mercury	2.55E-07	1.9E-05	8.4E-05	1.9E-05	8.4E-05	1.9E-05	8.4E-05
Naphthalene	5.98E-07	4.5E-05	2.0E-04	4.5E-05	2.0E-04	4.5E-05	2.0E-04
Nickel	2.06E-06	1.6E-04	6.8E-04	1.6E-04	6.8E-04	1.6E-04	6.8E-04
Phenanathrene	1.67E-08	1.3E-06	5.5E-06	1.3E-06	5.5E-06	1.3E-06	5.5E-06
Pyrene	4.90E-09	3.7E-07	1.6E-06	3.7E-07	1.6E-06	3.7E-07	1.6E-06
Selenium	2.35E-08	1.8E-06	7.8E-06	1.8E-06	7.8E-06	1.8E-06	7.8E-06
Toluene	3.33E-06	2.5E-04	1.1E-03	2.5E-04	1.1E-03	2.5E-04	1.1E-03
<b>Total</b>		<b>0.14</b>	<b>0.61</b>	<b>0.14</b>	<b>0.61</b>	<b>0.14</b>	<b>0.61</b>

\*Emission Factors from AP-42, 5th Edition, Section 1.4, "External Combustion Sources," 7/98

**Pacific Ethanol Magic Valley, LLC  
Storage Tanks**

Undenatured EtOH                      60,000,000 gal/yr  
Denaturant                                3,000,000 gal/yr  
Denatured EtOH                        63,000,000 gal/yr  
190 Proof                                  600,000 gal/yr

Tank	Contents	Throughput	Capacity
TK01	190 Proof (1% of 60,000,000)	600,000 gal/yr	174,500 gallons
TK02	Denaturant	3,000,000 gal/yr	58,750 gallons
TK03	200 Proof Tank (50% of 60,000,000)	30,000,000 gal/yr	174,500 gallons
TK04	200 Proof Tank (50% of 60,000,000)	30,000,000 gal/yr	174,500 gallons
TK05	Denatured EtOH (50% of 63,000,000)	31,500,000 gal/yr	587,000 gallons
TK06	Denatured EtOH (50% of 63,000,000)	31,500,000 gal/yr	587,000 gallons

	TOTAL Ethanol Emissions (lb/yr) from Tanks 4.09	TOTAL gasoline emissions (lb/yr)	Gasoline (speciated) Cyclohexane 0.5% (lb/year)	Gasoline (speciated) Benzene 2.5% (lb/year)	Gasoline (speciated) Hexane 1.5% (lb/year)	Gasoline (speciated) Pentane 50% (lb/year)	Gasoline (speciated) NeoHexane 31.5% (lb/year)	Gasoline (speciated) Toluene 5% (lb/year)	Gasoline (speciated) Xylene 5% (lb/year)	Gasoline (speciated) Ethyl Benzene 1.5% (lb/year)	Gasoline (speciated) 1,2,4- Trimethyl benzene 2.5% (lb/year)	Carbon Disulfide 0.005% (lb/year)	Cumene 0.01% (lb/year)
Loadout		4201.39	21.01	105.03	63.02	2100.70	1323.44	210.07	210.07	63.02	105.03	0.21	0.42
TK01	108.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TK02	0.00	1584.81	7.92	39.62	23.77	792.41	499.22	79.24	79.24	23.77	39.62	0.08	0.16
TK03	380.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TK04	380.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TK05	288.89	51.63	0.26	1.29	0.77	25.82	16.26	2.58	2.58	0.77	1.29	0.00	0.01
TK06	288.89	51.63	0.26	1.29	0.77	25.82	16.26	2.58	2.58	0.77	1.29	0.00	0.01
TOTALS (lb/year)	1448.01	1688.07	8.44	42.20	25.32	844.04	531.74	84.40	84.40	25.32	42.20	0.08	0.17
TOTALS (ton/year)	0.72	0.84	0.00	0.02	0.01	0.42	0.27	0.04	0.04	0.01	0.02	0.00	0.00
TOTALS (lb/hr)	0.17	0.19	0.00	0.00	0.00	0.10	0.06	0.01	0.01	0.00	0.00	0.00	0.00

**HAP Emissions from Storage Tanks**

HAP Emissions from Storage Tanks							
Pollutant	Emissions Source						
Storage Tanks	TK001	TK002	TK003	TK004	TK005	TK006	
VOC (lbs/yr)	108.57	1584.81	380.83	380.83	340.52	340.52	
VOC (tons/yr)	0.05	0.79	0.19	0.19	0.17	0.17	
HAP Fractions							
Benzene		2.50E-02			2.50E-02	2.50E-02	
Carbon Disulfide		5.00E-04			5.00E-04	5.00E-04	
Cumene		1.00E-04			1.00E-04	1.00E-04	
Ethylbenzene		1.50E-02			1.50E-02	1.50E-02	
n-Hexane		1.50E-02			1.50E-02	1.50E-02	
Toluene		5.00E-02			5.00E-02	5.00E-02	
Xylenes		5.00E-02			5.00E-02	5.00E-02	
HAP Emissions (tpy)							Total
Benzene		1.98E-02			2.13E-04	2.13E-04	2.02E-02
Carbon Disulfide		3.96E-04			4.26E-06	4.26E-06	4.05E-04
Cumene		7.92E-05			8.51E-07	8.51E-07	8.09E-05
Ethylbenzene		1.19E-02			1.28E-04	1.28E-04	1.21E-02
n-Hexane		1.19E-02			1.28E-04	1.28E-04	1.21E-02
Toluene		3.96E-02			4.26E-04	4.26E-04	4.05E-02
Xylenes		3.96E-02			8.51E-03	4.26E-04	4.86E-02
Total	0.00E+00	1.23E-01	0.00E+00		9.41E-03	1.32E-03	1.34E-01

**Pacific Ethanol Magic Valley, LLC  
Ethanol Loading Rack Emissions**

From Fifth Edition AP-42, Section 5.2:

$$L = 12.46 \cdot S \cdot P \cdot M \div T$$

where:

L = Loading Loss, lb VOC/1000 gal of liquid loaded  
S = Saturation Factor (AP-42 Table 5.2-1)  
P = True Vapor Pressure of Liquid Loaded, psia  
M = Molecular Weight of Vapors, lb/lb-mole  
T = Temperature of Bulk Liquid Loaded, R

The values of P, T, and M are taken from the TANKS software which calculates the annual average bulk product temperature based on the annual average temperatures for the city of Pocatello, ID. The PTE is based on loading the maximum volume of ethanol that can be distilled by the facility plus denaturant at a concentration of 5 % by volume.

The submerged loading rack for truck loadout employs an air pollution control device (RCO) with a VOC destruction efficiency of 99.0%. As shown, it is conservative to assume all trucks previously carried gasoline and will be controlled using the attached control device.

Product	Annual Throughput (1000 gal)	Saturation Factor S	Vapor Molecular Weight MW	Product Temperature T (deg R)	True Vapor Pressure P (psia)	Loading Loss (lb/1000 gal)	Uncontrolled Loss		Controlled Loss 99%	
							(lb/hr)	(tpy)	(lb/hr)	(tpy)
<b>Rail Loadout</b>										
Denatured Ethanol	63,000	0.6	50.0049	506.04	0.5284	0.3904	2.81	12.30	0.03	0.12
<b>Truck Loadout</b>										
Gasoline	63,000	1	66.0000	506.04	4.1037	6.6689	47.96	210.07	0.48	2.10
									<b>Total* =</b>	<b>2.10</b>

\*Loadout is assumed to be 100% truck loadout for most conservative value.

**Pacific Ethanol Magic Valley, LLC**  
**Fugitive Dust Emissions from Truck Traffic, FS01**

$$E = [k * (sL/2)^{0.65} * (W/3)^{1.5} - C] (1 - (P/4N))$$

AP-42, Section 13.2.2-1

Factor	Description	Source	PM Value	PM <sub>10</sub> Value	PM <sub>2.5</sub> Value
E =	Emission factor (lb/VMT)	Calculation, above	1.06	0.21	0.03
k =	PM Particle size multiplier (lb/VMT)	AP-42, Section 13.2.1	0.082	0.016	0.0024
sL =	Road surface silt loading (g/m <sup>2</sup> )	AP-42, Section 13.2.1-2	0.60	0.60	0.60
C =	Vehicle exhaust emission factor		0.0005	0.0005	0.0004
P =	Number of "wet" days in an averaging period		90	90	90
N =	Number of days in an averaging period		365	365	365
W =	Mean vehicle weight (ton)		29.00	29.00	29.0

**PM Emissions from Paved Roads**

Activity	Quantity Transported per truck	No. of Trucks (truck/yr)	Miles Traveled per Truck (miles/truck)	Annual Mileage (VMT/yr)	Uncontrolled PM Emissions (lb/yr)	Uncontrolled PM Emissions (tpy)
Grain receiving	25 ton	25,169	0.50	12,584	13,306	6.65
Wet Cake haul out	25 ton	24,579	0.50	12,289	12,994	6.50
Ethanol haul out	8,000 gal	7,875	0.32	2,520	2,665	1.33
Denaturant delivery	8,000 gal	375	0.32	120	127	0.06
Grain loadout	25 ton	21,900	0.50	10,950	11,578	5.79
<b>Total</b>						<b>20.33</b>

**PM<sub>10</sub> Emissions from Paved Roads**

Activity	Quantity Transported per truck	No. of Trucks (truck/yr)	Miles Traveled per Truck (miles/truck)	Annual Mileage (VMT/yr)	Uncontrolled PM <sub>10</sub> Emissions (lb/yr)	Uncontrolled PM <sub>10</sub> Emissions (tpy)
Grain receiving	25 ton	25,169	0.50	12,584	2,596	1.30
Wet Cake haul out	25 ton	24,579	0.50	12,289	2,535	1.27
Ethanol haul out	8,000 gal	7,875	0.32	2,520	520	0.26
Denaturant delivery	8,000 gal	375	0.32	120	25	0.01
Grain loadout	25 ton	21,900	0.50	10,950	2,259	1.13
<b>Total</b>						<b>3.97</b>

**PM<sub>2.5</sub> Emissions from Paved Roads**

Activity	Quantity Transported per truck	No. of Trucks (truck/yr)	Miles Traveled per Truck (miles/truck)	Annual Mileage (VMT/yr)	Uncontrolled PM <sub>2.5</sub> Emissions (lb/yr)	Uncontrolled PM <sub>2.5</sub> Emissions (tpy)
Grain receiving	25 ton	25,169	0.50	12,584	389	0.19
Wet Cake haul out	25 ton	24,579	0.50	12,289	380	0.19
Ethanol haul out	8,000 gal	7,875	0.32	2,520	78	0.04
Denaturant delivery	8,000 gal	375	0.32	120	4	0.00
Grain loadout	25 ton	21,900	0.50	10,950	339	0.17
<b>Total</b>						<b>0.60</b>

## Pacific Ethanol Magic Valley, LLC Wetcake Storage Emissions, FS03

*Wetcake emissions based on November 2, 2004 test data from a wetcake storage building at DENCO, LLC in Morris, MN.*

### **Normal Operating Scenario**

Production Rates:

18 tons/hr wetcake (wet basis) production @ DENCO  
70.1 tons/hr wetcake (wet basis) production @ Pacific Ethanol Magic Valley, LLC (Max)

### **DENCO Test Results\* -> Emission Factor -> Magic Valley Estimated Emissions**

Detection?**	Pollutant	DENCO lb/hr @ 18 ton/hr production rate	Emission Factor (lb/ton wetcake)	Potential Estimated Emissions (lb/hr)	Potential Estimated Emissions (tpy)
non-detect	Acetaldehyde	0.001	5.56E-05	5.85E-03	2.56E-02
non-detect	Acrolein	0.00017	9.17E-06	9.64E-04	4.22E-03
	Acetic Acid	0.08	4.44E-03	4.68E-01	2.05E+00
	Ethanol	0.02	1.11E-03	1.17E-01	5.12E-01
non-detect	Formaldehyde	0.002	1.11E-04	1.17E-02	5.12E-02
non-detect	Formic Acid	---	---	---	---
non-detect	2-furaldehyde	---	---	---	---
non-detect	Methanol	0.00125	6.94E-05	7.31E-03	3.20E-02
<b>VOC Total</b>				<b>0.610</b>	<b>2.67</b>
<b>HAPs Total</b>				<b>0.026</b>	<b>0.11</b>

\*Emission estimates based on November 2, 2004 emission testing at wetcake storage building at

\*\*1/2 the detection limit used as emission estimate for non-detect results.

**Pacific Ethanol Magic Valley, LLC  
Equipment Leak VOC Emissions, FS04**

Process Stream	Equipment Component Source	Product	Component Count*	Emission Factor *** (lb/comp.-hr)	Uncontrolled Rate**** (lb/hr)	LDAR Control Effectiveness	Controlled Rate (lb/hr)	TOC weight** (%)	VOC Emissions (lb/hr)	VOC Emissions (tpy)
Fermentation	Valves	Gas/Vapor	0.0	0.01316	0.00	87%	0.00	13.00%	0.00	0.00
	Valves	Light Liquid	90.0	0.00888	0.80	84%	0.13	13.00%	0.02	0.07
	Pumps	Light Liquid	6.0	0.04387	0.26	69%	0.08	13.00%	0.01	0.05
	Compressor Seals	Gas/Vapor	0.0	0.50265	0.00	75%	0.00	13.00%	0.00	0.00
	Pressure-Relief Valves	Gas/Vapor	5.0	0.22928	1.15	95%	0.06	13.00%	0.01	0.03
	Sampling Connections	All	0.0	0.03307	0.00	87%	0.00	13.00%	0.00	0.00
	Open-ended Lines	All	5.0	0.00376	0.02	84%	0.00	13.00%	0.00	0.00
	Flanges (connectors)	All	166.0	0.00403	0.67	84%	0.11	13.00%	0.01	0.06
Distillation	Valves	Gas/Vapor	45.0	0.01316	0.59	87%	0.08	81.70%	0.06	0.28
	Valves	Light Liquid	22.0	0.00888	0.20	84%	0.03	87.10%	0.03	0.12
	Pumps	Light Liquid	7.0	0.04387	0.31	69%	0.10	81.70%	0.08	0.34
	Compressor Seals	Gas/Vapor	0.0	0.50265	0.00	75%	0.00	81.70%	0.00	0.00
	Pressure-Relief Valves	Gas/Vapor	7.0	0.22928	1.60	95%	0.08	81.70%	0.07	0.29
	Sampling Connections	All	0.0	0.03307	0.00	87%	0.00	81.70%	0.00	0.00
	Open-ended Lines	All	15.0	0.00376	0.06	84%	0.01	81.70%	0.01	0.03
	Flanges (connectors)	All	190.0	0.00403	0.77	84%	0.12	81.70%	0.10	0.44
Tank Farm	Valves	Gas/Vapor	0.0	0.01316	0.00	87%	0.00	100.00%	0.00	0.00
	Valves	Light Liquid	70.0	0.00888	0.62	84%	0.10	100.00%	0.10	0.44
	Pumps	Light Liquid	5.0	0.04387	0.22	69%	0.07	100.00%	0.07	0.30
	Compressor Seals	Gas/Vapor	0.0	0.50265	0.00	75%	0.00	100.00%	0.00	0.00
	Pressure-Relief Valves	Gas/Vapor	5.0	0.22928	1.15	95%	0.06	100.00%	0.06	0.25
	Sampling Connections	All	0.0	0.03307	0.00	87%	0.00	100.00%	0.00	0.00
	Open-ended Lines	All	6.0	0.00376	0.02	84%	0.00	100.00%	0.00	0.02
	Flanges (connectors)	All	110.0	0.00403	0.44	84%	0.07	100.00%	0.07	0.31
<b>Total</b>			<b>754.0</b>		<b>8.87</b>		<b>1.09</b>		<b>0.69</b>	<b>3.02</b>

\*Component counts are based on Subpart VV equipment inventory from Delta T.

\*\*TOC is considered to be worst case for each process stream identified.

\*\*\*Emission factors taken from Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Table 2-1 and Table 5-2.

\*\*\*\*Emission rate is taken from Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, and based on the Leak Detection and Repair Program.

**HAP Emission Calculation**

Pollutant	Fraction	Emissions (tpy)
Acetaldehyde	2.00E-04	6.04E-04
Methanol	2.00E-04	6.04E-04
Benzene	2.50E-03	7.55E-03
Carbon Disulfide	2.00E-05	6.04E-05
Cumene	1.00E-03	3.02E-03
Ethylbenzene	5.00E-05	1.51E-04
n-Hexane	5.00E-02	1.51E-01
Toluene	5.00E-03	1.51E-02
Xylenes	5.00E-04	1.51E-03
<b>Total</b>		<b>0.18</b>